

WHAT IS CLAIMED IS:

1. A data transmission system comprising a transmission line for transmitting isochronous data to be processed at a timing in synchronization with a reference signal having a fixed cycle and asynchronous data to be processed at an arbitrary timing, plural source devices for transmitting the isochronous data to the transmission line, and at least one sink device for receiving plural pieces of the isochronous data which have been transmitted to the transmission line wherein

a specific device which is one of the sink device and the plural source devices transmits reference signal information for reproducing a predetermined reference signal as a reference for a processing timing of the isochronous data to the transmission line, and

the plural source devices other than the specific device receive the reference signal information which has been transmitted to the transmission line, obtain the predetermined reference signal, and output the isochronous data which are synchronized with the reference signal.

2. The data transmission system of Claim 1 wherein

the data transmission on the transmission line is repeatedly performed for each transmission frame as a unit of transmission data,

the transmission frame has a frame header which contains information indicating the head of each transmission frame and an isochronous data slot which contains the isochronous data, and

the specific device transmits the reference signal information with making the information to be included in the frame header.

3. The data transmission system of Claim 2 wherein the specific device periodically transmits the special frame header which includes the reference signal information.

4. The data transmission system of Claim 1 wherein the data transmission on the transmission line is performed for each transmission frame as a unit of transmission data,

the transmission frame has a frame header which contains information indicating the head of each transmission frame, an isochronous data slot which contains the isochronous data, and an asynchronous data slot which contains the asynchronous data,

the sink device performs a processing of transmitting/receiving the asynchronous data, in addition to the processing of receiving the isochronous data,

the source device performs a processing of transmitting/receiving the asynchronous data, in addition to the processing of transmitting the isochronous data, and the specific device stores the reference signal information in the isochronous data slot or asynchronous data slot and transmits the isochronous data slot or asynchronous data slot.

5. The data transmission system of Claim 1 wherein the specific device transmits a transmission/receipt designation packet which contains information designating a source device as a transmission source of the isochronous data and a sink device as a transmission destination of the isochronous data, to the transmission line, and

a specific transmission/receipt designation packet which is transmitted from the specific device includes the reference signal information.

6. The data transmission system of Claim 5 wherein the specific device periodically transmits the specific transmission/receipt designation packet including the reference signal information.

7. The data transmission system of Claim 1 wherein the sink device and the source device perform a

processing of transmitting/receiving a data packet which contains the isochronous data or asynchronous data, and the specific device transmits the transmission/receipt designation packet which contains information designating the sink device as a transmission source of the isochronous data, the sink device as a transmission destination of the isochronous data, and the sink device or source device as a transmission source and transmission destination of the asynchronous data, to the transmission line, and transmits the reference signal information with making the information included in the isochronous data or asynchronous data.

8. The data transmission system of Claim 1 wherein the sink device and the source device perform a processing of transmitting/receiving a data packet which contains the isochronous data or asynchronous data,

the data transmission on the transmission line repeatedly performs a unit transmission processing for transmitting data in a fixed time period,

the source and sink devices for transmitting the data packet in each transmission cycle as the period of the unit transmission processing perform arbitration for obtaining a transmission right to transmit the data packet, and transmit the data packet between a transmission source

device which obtains the transmission right of the data packet by the arbitration and a transmission destination device corresponding to the transmission source device, and

the specific device transmits a cycle start packet which indicates a start timing of the transmission cycle as the period of the unit transmission processing every fixed time period, and transmits the reference signal information to the transmission line with making the information included in the isochronous data or asynchronous data.

9. The data transmission system of Claim 1 wherein plural individual transmission systems are formed, each including at least one said source device and at least one said sink device,

one specific device among the plural devices constituting each of the individual transmission systems transmits the reference signal information to other device in the individual transmission system including the specific device, and

the device other than the specific device in each of the individual transmission systems receives the reference signal information transmitted from the specific device, and reproduces a reference signal inherent to each of the individual transmission systems.

10. The data transmission system of Claim 1 wherein the sink device comprises a phase detector for detecting a phase shift amount of the received plural pieces of isochronous data, and transmits phase difference information which indicates the phase shift amount detected by the phase detector, and

at least one of the plural source devices modifies a timing of reproducing the reference signal from the reference signal information on the basis of the phase difference information which is transmitted from the sink device so as to reduce the phase shift amount in the sink device.

11. A data transmission system comprising a source device for transmitting isochronous data to be processed at a timing in synchronization with a reference signal having a fixed cycle, a sink device for receiving the isochronous data which have been transmitted from the source device, and first and second transmission lines having different data transmission directions, which connect the source device and the sink device in one-to-one relationship, wherein

the sink device performs an information transmission processing of transmitting reference signal information for

reproducing a predetermined reference signal as a reference of a processing timing of the isochronous data, to the source device via the first transmission line,

the source device performs a signal reproduction processing of receiving the reference signal information from the sink device and reproducing the predetermined reference signal from the received reference signal information, and a data transmission processing of transmitting the isochronous data to the sink device via the second transmission line in synchronization with the reproduced predetermined reference signal, and

a transmission speed of the isochronous data on the second transmission line is higher than a transmission speed of the reference signal information on the first transmission line.

12 The data transmission system of Claim 11 wherein the sink device and the source device perform a processing of transmitting/receiving asynchronous data to be processed at arbitrary timing,

the data transmission on each of the transmission lines is performed for each transmission frame as a unit of transmission data,

data transmission from the sink device to the source device is performed in a unit of a first transmission frame

which has a frame header indicating the head of each transmission frame and an asynchronous data slot containing the asynchronous data to be processed at arbitrary timing,

data transmission from the source device to the sink device is performed in a unit of a second transmission frame which has the frame header, an isochronous data slot containing the isochronous data and the asynchronous data slot, and

the sink device transmits the reference signal information with making the information included in the frame header of the first transmission frame.

13. The data transmission system of Claim 12 wherein the sink device transmits the frame header including the processing timing information in a fixed cycle.

14. The data transmission system of Claim 11 wherein the sink device and the source device perform a processing of transmitting/receiving asynchronous data to be processed at arbitrary timing,

the data transmission on each of the transmission lines is performed for each transmission frame as a unit of transmission data,

data transmission from the sink device to the source device is performed in a unit of a first transmission frame



which has a frame header indicating the head of each transmission frame and an asynchronous data slot containing the asynchronous data to be processed at arbitrary timing,

data transmission from the source device to the sink device is performed in a unit of a second transmission frame which has the frame header and an isochronous data slot containing the isochronous data and the asynchronous data slot, and

the sink device transmits the reference signal information with making the reference signal information included in the asynchronous data.

15. The data transmission system of Claim 11 wherein the sink device stores information which designates a device as a transmission source of the isochronous data and a device as a transmission destination of the isochronous data, in a transmission/receipt designation packet, and transmits the transmission/receipt designation packet to the first transmission line, and

a specific transmission/receipt designation packet which is transmitted from the sink device includes the reference signal information.

16. The data transmission system of Claim 15 wherein the sink device periodically transmits the specific

transmission/receipt designation packet including the reference signal information.

17. The data transmission system of Claim 11 wherein the sink device performs a processing of transmitting/receiving asynchronous data to be processed at an arbitrary timing as well as performs a processing of storing information which designates a device as a transmission source of the isochronous data or asynchronous data and a device as a transmission destination of the isochronous data or asynchronous data, in a transmission/receipt designation packet to be transmitted to the first transmission line, and storing the reference signal information in a required asynchronous data packet among asynchronous data packets including the asynchronous data to be transmitted to the first transmission line, and the source device performs a processing of transmitting/receiving the asynchronous data to be processed at an arbitrary timing as well as transmits an isochronous data packet which contains the isochronous data to the second transmission line.

18. The data transmission system of Claim 1 ~~or 11~~ wherein the transmission line is composed of an optical fiber.

19. The data transmission system of Claim 1 wherein the sink device and the source device transmit/receive data as an optical signal, and

the transmission line comprises:

an optical star coupler having plural input terminals and plural output terminals, and outputting the optical signal which has been supplied to any of the input terminals from all of the output terminals;

output side optical fibers for connecting output terminals of the sink device and the source device and the input terminals of the optical star coupler; and

input side optical fibers for connecting input terminals of the sink device and the source device and the output terminals of the optical star coupler.

20. The data transmission system of Claim 11 wherein the sink device transmits output data as an electric signal and receives input data as an optical signal,

the source device transmits output data as an optical signal and receives input data as an electric signal,

the first transmission line for transmitting data from the sink device to the source device is composed of a conductor which propagate the electric signal, and

the second transmission line for transmitting data from the source device to the sink device is composed of

an optical fiber which propagate the optical signal.

a 21. The data transmission system of Claim 1 ~~or 11~~ wherein the source device is connected to a video data output unit which has an image-taking unit for performing an image-taking processing or a video reproduction unit for performing a reproduction processing for video data, and transmits the video data output from the video data output unit to the transmission line as isochronous data, and the sink device is connected to a video processing device for composing or recording plural pieces of video data, and receives the plural pieces of video data which have been transmitted from the plural source devices as isochronous data to supply the data to the video processing device.

22. The data transmission system of Claim 21 wherein the source device comprises a video compression unit for compressing the video data which have been supplied from the video data output unit and outputting compressed video data, and transmits the compressed video data as the isochronous data.

23. The data transmission system of Claim 1 ~~or 11~~ wherein the sink device, the source device, and the

transmission line which connects these devices are mounted on a motor vehicle,

the source device is connected to a motor-vehicle-mounted video data output unit having an image-taking unit for performing an image-taking processing or a video reproduction unit for performing a reproduction processing for video data, and transmits the video data which have been output from the video data output unit as the isochronous data to the transmission line,

the sink device is connected to a motor-vehicle-mounted video processing device for composing or recording plural pieces of video data, and receives the plural pieces of video data which have been transmitted from the plural source devices as the isochronous data to supply the data to the video processing device, and

the sink device, the source device, and the transmission line constitute a network for transmitting the video data in the motor vehicle.

24. A data transmission method for transmitting isochronous data to be processed at a timing in synchronization with a reference signal having a fixed cycle and asynchronous data to be processed as an arbitrary timing, from plural source devices as transmission sources of the isochronous data, to at least one sink device as a

transmission destination of the isochronous data via a transmission line comprising:

a data transmission step of transmitting reference signal information for reproducing a predetermined reference signal as a reference of a processing timing of the isochronous data from a specific device among the sink device and the plural source devices to the transmission line; and

a signal reproduction step of receiving the reference signal information which has been transmitted to the transmission line and reproducing the reference signal in the plural source devices.

25. A data transmission system for transmitting isochronous data to be processed at a timing in synchronization with a reference signal having a fixed cycle from a source device as a transmission source of the isochronous data to a sink device as a transmission destination of the isochronous data which is connected to the source device in one-to-one relationship comprising:

an information transmission step of transmitting reference signal information for reproducing a predetermined reference signal as a reference of a processing timing of the isochronous data, from the sink device to the source device via a first transmission line;

a signal reproduction step of receiving the reference signal information from the sink device and reproducing the predetermined reference signal in the source device; and

a data transmission step of transmitting the isochronous data to the sink device via a second transmission line in synchronization with the reproduced predetermined reference signal, wherein

a transmission speed of the isochronous data on the second transmission line is higher than a transmission speed of the reference signal information on the first transmission line.

26. A data transmission apparatus which is connected to a transmission line, and transmits or receives isochronous data to be processed at a timing in synchronization with a reference signal having a fixed cycle and asynchronous data to be processed at an arbitrary timing via the transmission line comprising:

a controller for controlling the transmission or receipt of the isochronous data and asynchronous data; and

a reference signal generator for reproducing the reference signal on the basis of reference signal information for reproducing a predetermined reference signal as a reference of a processing timing of the isochronous data, which have been received as the

asynchronous data.

27. The data transmission apparatus of Claim 26 comprising an image-taking unit for performing an image-taking processing and outputting video data, wherein

the image-taking unit outputs the video data in synchronization with the reference signal which has been reproduced by the reference signal generator, and

the controller transmits the video data which have been output from the image-taking unit as the isochronous data to the transmission line.

28. The data transmission apparatus of Claim 27 comprising:

a video compression unit for compressing the video data from the image-taking unit and outputting compressed video data, wherein

the controller transmits the compressed video data as the isochronous data.